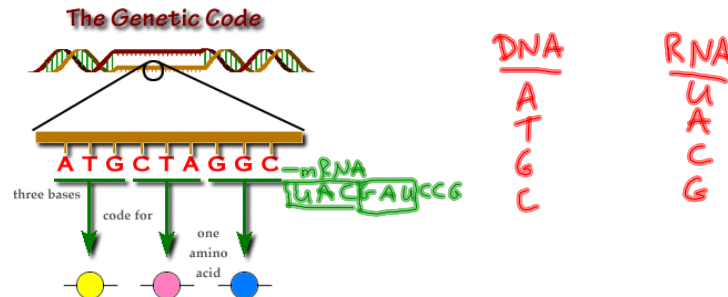


## Protein Synthesis

Reference: pp. 242-253

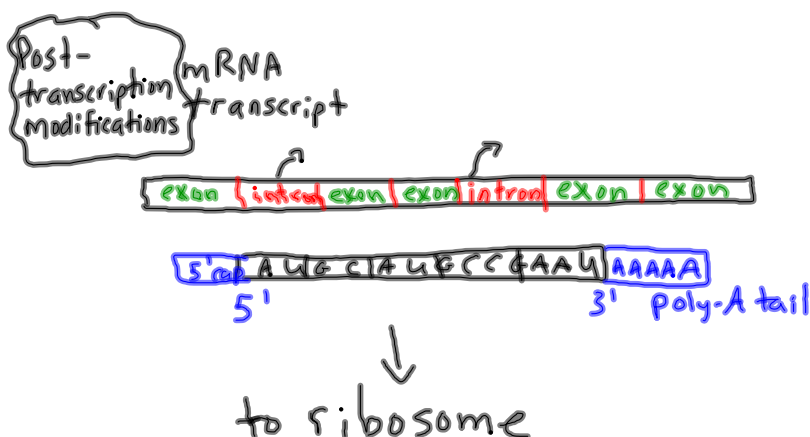
The central dogma (=most accepted belief) of molecular genetics is that proteins are synthesized by the sequence of events known as transcription and translation.

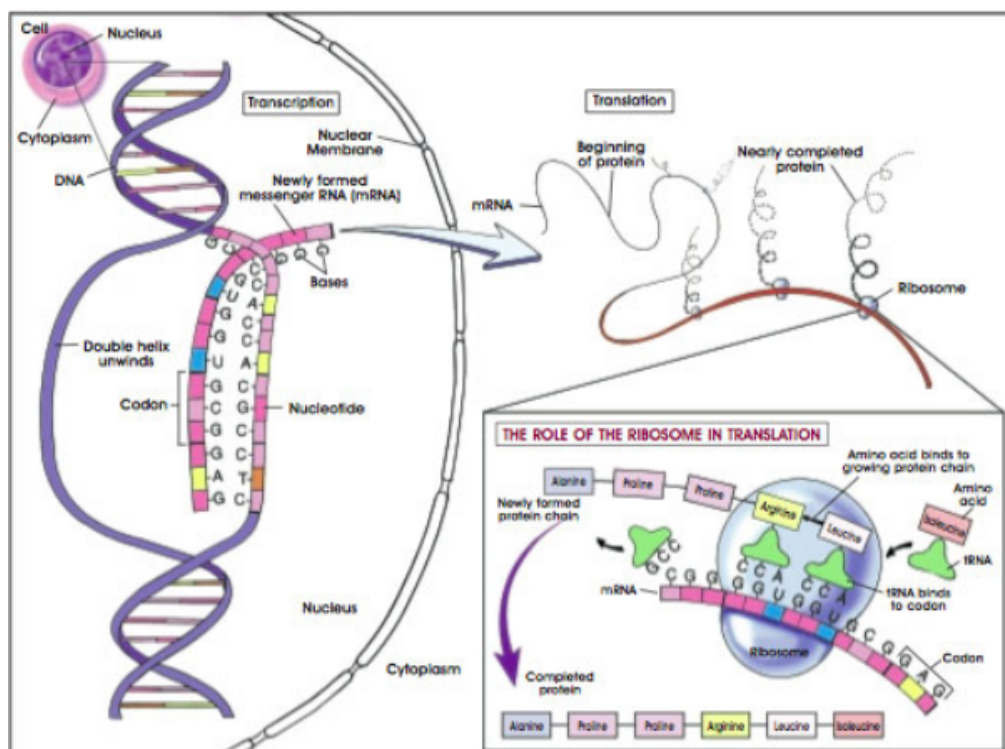


Transcription occurs in three steps:

- 1) Initiation - RNA polymerase binds to the promoter region on DNA (a region high in A and T's)  
-the DNA segment is unwound, exposing the template strand
- 2) Elongation - RNA polymerase adds complementary nucleotides to a growing mRNA strand in the 5' to 3' direction (20-50/second)
- 3) Termination - at the end of the gene a terminator sequence is detected and RNA polymerase and mRNA are released

After leaving the DNA template strand, the new mRNA is modified several ways. First, a **5' cap** is added to protect mRNA from enzymatic digestion. A string of adenines are added to the 3' end, which is now called a **poly-A tail**. Finally, regions of the strand called **introns** are removed. Introns are non-coding regions. The coding regions of the strand remain, these are called **exons**. The strand is now called the **mRNA transcript**.



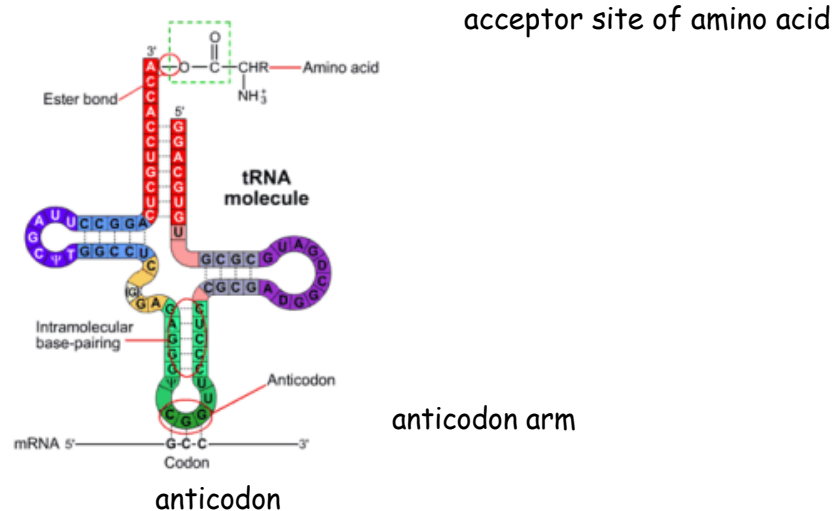


**Translation** also occurs in three steps:

- 1) Initiation - ribosomes recognize the 5' cap and bind to the mRNA transcript
  - ribosomes consist of a large and a small subunit which clamp around the mRNA strand and move along it in the 5' to 3' direction
  - translation begins when the ribosome reads the start codon (AUG) and the amino acid (a.a.) methionine is added

**\*A note about tRNA**

tRNA is a single-stranded nucleic acid with a cloverleaf shape. One arm of tRNA contains the **anticodon** which is complementary to the codon on mRNA. At the 3' end is found the acceptor site for its amino acid. When its a.a. is attached, tRNA is called **aminoacyl-tRNA**.



- 2) Elongation - the large ribosomal subunit has two general sites:
  - ➡ the P site holds the tRNA and the attached polypeptide chain
  - ➡ the A site holds the tRNA with the next amino acid to be attached to the growing polypeptide chain
  - as codons are read by the ribosome, amino acids are brought in by tRNA's and attached to the polypeptide chain by peptide bonds until a stop codon is read in the A site
- 3) Termination - when the ribosome reads a stop codon it stalls and a protein called **release factor** helps to release the polypeptide chain

Homework: p. 249, # 2, 3, 8 and on p.254, # 3, 4, 6